

RED LIGHT THERAPY

The Process, Mitochondrial Interaction and Benefits

Red Light Therapy (photobiomodulation) uses low-level wavelengths of red and near-infrared light to penetrate the skin and tissues, where it is absorbed by mitochondria to enhance cellular energy production and support overall health and healing.



KEY WAVELENGTHS

Red Light: 620 – 700 nm

Near-Infrared: 700 – 1100 nm



Optimal penetration into skin and tissues



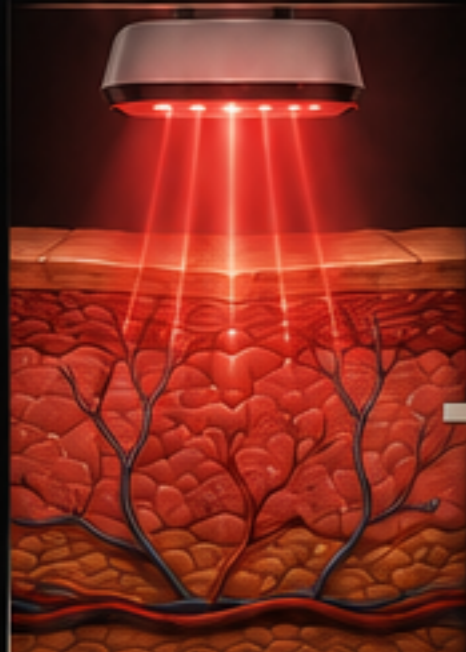
Absorbed by cellular chromophores



Triggers cellular energy and repair processes

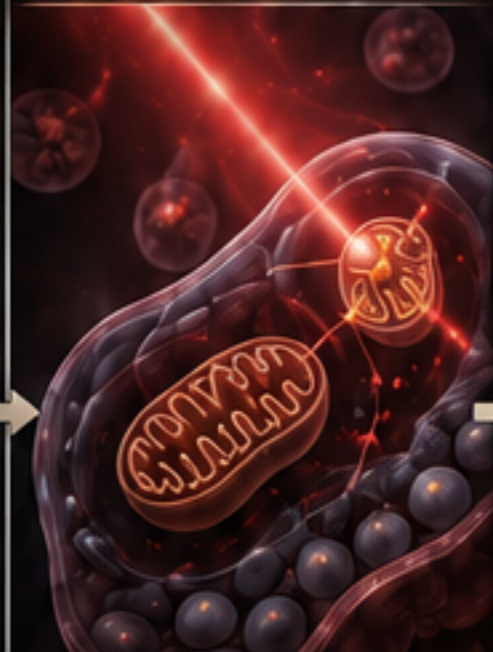
THE PROCESS: HOW RED LIGHT THERAPY WORKS

1 Light Emission



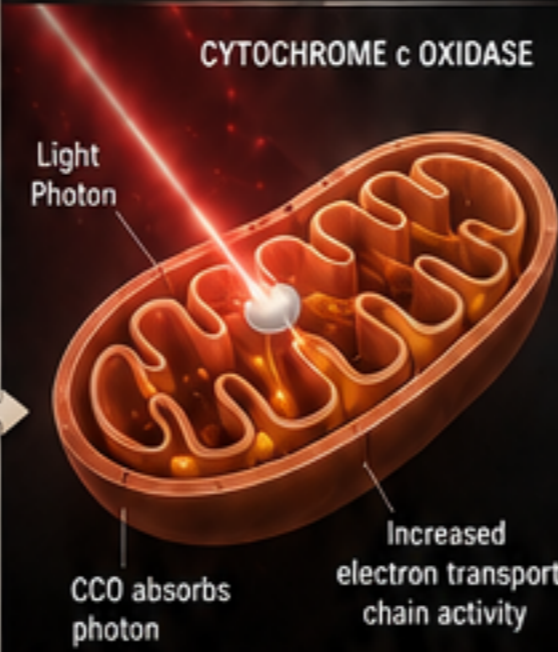
Red and near-infrared light is emitted from the device and penetrates the skin and underlying tissues.

2 Cellular Absorption



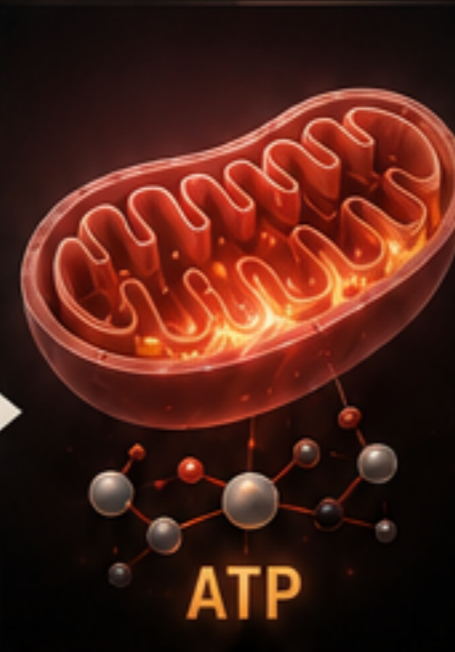
Photons are absorbed by chromophores in the mitochondria, primarily cytochrome c oxidase (CCO).

3 Mitochondrial Activation



Absorption of light by CCO enhances electron transport chain activity, reduces nitric oxide inhibition, and increases mitochondrial membrane potential.

4 Increased ATP Production



Mitochondria produce more ATP (adenosine triphosphate), the cell's primary energy currency.

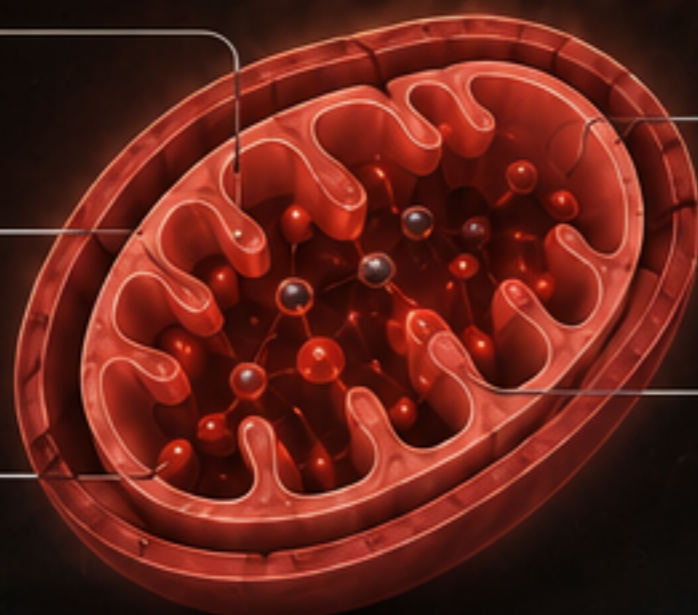
5 Cellular & Systemic Effects



Boosted cellular energy leads to improved function, repair, and regeneration across multiple body systems.

MITOCHONDRIAL INTERACTIONS IN DETAIL

- Cytochrome c oxidase (CCO)**
Primary light absorber in the mitochondrial respiratory chain.
- Increased Electron Transport**
Enhances electron flow, improving efficiency and ATP output.
- Nitric Oxide Dissociation**
Red/NIR light helps release nitric oxide bound to CCO, relieving inhibition and improving oxygen utilization.



- Increased ATP**
More energy for cellular function, repair, and recovery.
- Reduced Oxidative Stress**
Improved mitochondrial function leads to lower ROS production and better antioxidant balance.

DOWNSTREAM EFFECTS

- ↑ Gene expression (e.g., NRF1, PGC-1α)
- ↑ Mitochondrial biogenesis
- ↑ Cellular metabolism
- ↑ Tissue oxygenation & circulation
- ↑ Collagen synthesis
- ↓ Inflammation
- ↓ Pain signaling
- ↑ Cellular repair & regeneration

THE BENEFITS



Improved Energy
Increases ATP production for more energy and less fatigue.



Faster Recovery
Enhances muscle repair, reduces soreness and speeds up recovery time.



Pain Relief
Reduces inflammation and modulates pain pathways naturally.



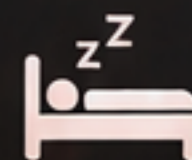
Skin Health
Boosts collagen production, improves elasticity, and reduces wrinkles.



Immune Support
Supports immune cell function and reduces inflammatory response.



Brain Health
Supports neuroprotection, cognitive function, and mood regulation.



Better Sleep
Helps regulate circadian rhythms and promotes deeper, more restful sleep.



By naturally enhancing mitochondrial function, Red Light Therapy helps your cells produce more energy, repair more efficiently, and function at their best—supporting whole-body health and vitality.